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ABSTRACT

A computer system using interactive videodisc was developed and used by the American Heart Association to teach nursing students and others cardiopulmonary resuscitation (CPR). Two studies were made of the use of the system. Between September 1982 and April 1983, 48 participants received CPR instruction by interactive videodisc and 51 by traditional methods. No significant difference was found in skill tests of the two groups of students. A second study was conducted to determine how long it would take to learn and be certified through the videodisc program. Three groups totaling 96 students established times to learn the procedures. Three key implications can be seen for nursing education as a result of using videodisc instruction: (1) further study needs to be made of individual learning differences and suitability to the videodisc mode; (2) time to learn is not a clear predictor of performance and varying student approaches need to be accounted for; and (3) the similar mean times of students learning alone or in groups suggest possibilities for cost effectiveness. (KC)

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Performance and Norms of Time for Adult Learners Instructed in CPR by an Interactive Videodisc System

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Between 1982 and 1985, two stages of research were conducted using interactive videodisc CPR (cardiopulmonary resuscitation) instruction. In the first study, the effectiveness of interactive videodisc instruction was compared to that of traditional instruction and in a subsequent study, norms of time to certify in CPR were investigated. This presentation will provide background related to CPR instruction, give a description of both studies, and address implications for nursing education.

Background Related To CPR Instruction

While the emphasis given to training lay persons in CPR has undergone changes over the years, the ongoing value of having large numbers of persons in a community trained in CPR is recognized. For the victim of cardiac arrest, a 32% survival rate has been reported as a result of witnessed bystander CPR. (Cummins & Eisenberg, 1985). With the need for readily available CPR instruction apparent over the years, a number of self learning and media augmented strategies have been devised.

Instructional Strategies

Safar, et al. (1981) reported a study in which a self training system taught as effectively as live instruction and better than repetitive film viewing alone. DeBaca (1983) described a CPR course for hospital employees that used slides and audiotape followed by live instructor demonstration and return demonstration. Rehm (1983) reported the effective use of a videotape on CPR as part of instruction given to parents whose baby had been hospitalized.

Interactive Video CPR Instruction

With advances in computer and video technology a new instructional strategy for CPR emerged. A computer based system using videodisc was initially developed by David Hon at the American Heart Association in 1981 and continued to be developed by Actronics Inc. The technical features included a Sony LPD-1000 laser optical videodisc player, two monitors, a random access audio machine, an adapted Apple II computer and adult and infant Laerdal manikins wired with sensors to detect key CPR skills. The videodisc was selected over videotape because of its rapid random access capability (Hon 1982). Needed picture information could be displayed without delays that might interrupt the learner's concentration. Immediate feedback could be provided to reinforce pertinent information.

The software was programmed to reflect a live teaching situation including: 1) attention gaining measures, 2) orientations, 3) definitions, 4) objectives, 5) practice opportunities, 6) redundancies, 7) motivators, and 8) evaluation components. When the system is turned on the sponsoring agency the American Heart Association is displayed on the left and on the right is a light sensitive dot for beginning. Following this a menu appears for the learner to orient to the system through an explanation about the light pen or key pad, what the choice button does, how to access the dictionary of terms, how to locate major topics, practice on the manikins, or be tested. There are various ways in which the learners attention is obtained, held and restimulated at different points. For example, the beginning of the program shows actual footage of a person experiencing a cardiac arrest at a basketball game. The learner sees effective CPR rescue and connects with the reality of it. The content of the instructional program reflects current standards of the American Heart Association and is organized and sequenced to assist the learner to progress in knowledge and skills.

Theoretical Framework

Several broad areas of theory including systems, learning, and communication can serve as a basis for looking at interactive video CPR instruction. When used in a nursing context, the domains of nursing fit best by teasing out from external theories the elements that are likely to apply and then reformulating them anew for learners in nursing.

Concepts that relate to interactive video instruction are mobility, alteration and symbolization; Mobility in that the learner can move in different directions flexibly, alteration because of the many forms of redundant information that help a learner move from uncertainty to certainty in knowledge and skills, and symbolization since meaning is communicated to the learner through codes in words and pictures. These codes stimulate the learner to question further.

Study One: Validation of the Prototype

When the prototype system was ready, the American Heart Association requested a validation study to be done and this researcher became the investigator for the initial study. The American Heart Association set forth these requirements: 1) the study population would have no prereading, had never been certified and had some basic education level, 2) instruction would run six hours maximum and might be given in two segments, and 3) instructors at the national office of the American Heart Association would not be involved in evaluation.

The main research question in this study was, could the interactive video system instruct as effectively as live instruction. Using a quasi experimental approach, a convenience sample mostly of young adult nursing students, was randomly divided into two groups and taught either by traditional live instruction or interactive videodisc. The non nursing students were pharmacy or other university students. The setting was in a learning resources center of a baccalaureate school of nursing. In the traditional situation, each of the two instructors were certified in CPR. Three separate certified instructors conducted blind evaluations following the instruction of students from both the traditional and interactive videodisc groups.

Between September 1982 and April 1983, 48 participants received basic life support CPR instruction by interactive videodisc and 51 by traditional instruction. There were seven live instruction situations given. Each of these consisted of two sessions roughly a week apart and testing was conducted immediately after the second session. The average class size was 6.43 students for each instructor with a range from six to eight. For the interactive videodisc group, students were scheduled individually and in small groups according to their schedules. Some students who completed the heartsaver segment alone, were scheduled at their request with a small group to complete the other components of basic life support. There were times when the system malfunctioned and although it was serviced promptly, students had to be rescheduled. Of the forty eight students who completed on the system, approximately four fifths finished as part of a group of two or three students. An additional two did not return after the first instruction. Students on the system finished at different times singly, in pairs, or in groups of three. Arrangments were made for testing when approximately six students were ready to be evaluated. The space of days between learning and testing differed for students with an average time of 5.60 days between completing CPR instruction and being evaluated.

A 2 tail test with an alpha error equal to .05 was used for skill performance and is shown in Table 1.

Insert Table 1 Here

In examining the skill data shown in Table 1 the hypothesis for heartsaver cannot be rejected and it must be concluded that there is not significant difference between students taught by the interactive videodisc method and those taught by traditional instruction for single rescue. The data also show significant difference in situations of obstructed airway where more skills were passed on first attempt by students who learned on the interactive videodisc system.

This improves the overall result for basic life support and it may be concluded that a significantly greater proportion of students taught by the interactive videodisc method passed basic life support on the first testing than did students taught by traditional instruction.

In the knowledge section, all students completed a paper and pencil written examination. The same set of 50 multiple choice questions drawn from the American Heart Association questions were answered by both groups.

Insert Table 2 Here

Theory mean scores were as follows: for the interactive videodisc group 84.35 and for the traditional group 82.76. Using sign test z- 1.75, no significant difference was seen at α - .05. To summarize from study one, single rescue theory and skills were taught as well by both methods. This relates positively to a study reported by Edwards and Hannah in 1985 in which the interactive videodisc system taught lay persons as well as traditional instruction.

During the validation study, a frequently raised question was, "How long will this take? " as the student started working with the interactive videodisc system. A duration of approximately six hours for basic life support was known. To answer this question more precisely and to establish norms of time for the interactive video system, a second stage of research was begun in 1984.

Study Two: Norms of Time

Study two sought to determine how long it would take students to learn and certify as a result of interactive videodisc instruction. Carried out in the same setting this descriptive and exploratory study intended to provide new information based on observations and student feedback. A focus was given to relationships among events to help formulate problems for future investigations. Instead of structuring the learning situation into two sessions, participants were encouraged to direct their own time periods and paths of interactivety with the system. It was reasoned, why have an advanced technological system with multiple entry points and branches without allowing a learner to take advantage of them through self directed activities. This mode of operation would potentially affect the analysis because it was not known if the "n" would build in the groups to allow for comparisons. Eventually all data were handled descriptively showing measures of central tendency through the means and standard deviations.

Of the 96 students who participated in this study, three main groups emerged: 1) original certifiers who learned heartsaver, 2) recertifiers who learned heartsaver, and 3) recertifiers who learned basic rescue for adult and infant. In each group some students chose to learn in groups of 2, 3, or 4 students. Table 3 gives the mean time in minutes and standard deviations for each of the groups.

Insert Table 3 Here

For group 1, the original certifiers learned mostly in groups. Fifteen students had a mean time of 226.73 minutes with a SD of 52.65. Three learned alone with a mean time of 254.33 minutes and a SD of 115.77. For group 2, forty two learned in groups with a mean time of 201.19 minutes and a SD of 115.77. For group 3, of those recertifying in the five components of basic rescue of adult and infant, fourteen learned in groups with a mean time of 330.71 minutes and 98.54 SD. Seven learned singly with a mean time of 329.14 minutes and SD of 98.54. Overall there were similar mean times for students learning singly or in groups, that is, it took about as long on the average to go through alone as with a few others. The SDs are large reflecting the individual differences of students in minutes. Calculated in hours, the duration of time to learn and certify can be expressed as follows: 1) Eighteen original certifiers averaged 3.85 hours for heartsaver, 2) Thirty-eight recertifiers averaged 3.21 hours for heartsaver, and twenty-one recertifiers averaged 5.49 hours for basic rescue. In each of these groups there were students from the different years of the undergraduate program.

A small subsample of students could be identified who went through a fast track of the program, i.e. mostly quizzes and manikin practice. Table 4 shows that their mean times were less than those who chose the full program. The "n" is small however limiting generalization.

Insert Table 4 Here

The 96 students in study two were asked to describe their reactions to the interactive videodisc system.

Insert Table 5 Here

The most frequent unfavorable responses were: frustrating, detects faults, difficult and preference for a live instructor. Students also gave favorable reactions.

Insert Table 6 Here

The most frequently given favorable reactions dealt with: evaluation capability, self pacing, practice opportunities, and ability to individualize a path of instruction. An interesting point centers on evaluation which was both liked and disliked by students.

Implications for Nursing Education

What implications can be gained for nursing education? When one looks at the findings combined with understanding from relevant literature, these key points are suggested:

1) At least four major variables reflect the time factor and overlap to form relationships that could be studied further. These complex variables are: Individual learner differences, the interactive videodisc system with multiple branches and entry points, the informal learning environment and the nursing program as communicated through its objectives. Each one of these areas is complex and diverse studies could be done. For example a study of the type by Carrier, Davidson & Williams (1985), who found that children of high ability selected more choices of available optional material and more choices that improved their performance. This needs to be studied with adult learners. A different type of study involving individual differences was conducted by Wiley (1983) who determined that an individual's preference for structure influences his/her reactions to a self directed learning environment. The students in study two expressed preferences. This needs to be looked at more and also in relationship to experience with self directed learning systems.

2) Time to learn is not a clear predictor of performance. Some students taking a longer time did better; others did less well. For some students more time was used because they were curious where the many paths would go. For others, it meant a struggle in capturing the material. The fact that a real time clock is programmed into the practice experience (A videodisc-based course, 1983) does help to predict the duration of each skill attempt. Hannafin (1985) has noted that the extent of interactivity exerts an influence on time. It may take longer when a learner is highly active in the learning process. Koniak (1985) in using videotapes, observed that when learners skipped portions of instruction, learning time was reduced but performance was lowered in almost half of those skipping.

3) The similar mean times of students learning alone or in groups suggests possibilities for cost effectiveness. More students learning at a single unit reduces the overall cost.

For the theory portion of instruction it is conceivable that ten to twelve students might view this material together. Okey and Majer (1976) in studying computer asisted instruction observed that undergraduate s learned as effectively in groups of three or four as alone at a terminal. The exchange in the group helped members acquire the information more quickly. The dynamics of the group as it influences the learning of its members through interactive videodisc needs to be researched further.

4) The picture and word capability of interactive video is potentially powerful for learners, especially with the videodisc that rapidly displays a sharp picture of high quality (Clark, 1984). In a study of non computerized picture and word media, Strang (1973) found that skills were learned best when subjects were exposed to pictures plus oral and printed word formats. This combination is exactly what interactive video can accomodate. Nurse educators and learners in nursing could benefit from new knowledge in this area.

Summary

To summarize, as technology has made possible new ways to provide instruction, these innovations have been used to teach CPR. The most recent advance has been with interactive videodisc instruction and it has been shown to teach CPR as effectively as live instruction. Times to learn and certify have been established through groups of nursing students learning via the interactive videodisc system. Much future research can be done in this comprehensive and complex area for nursing education.

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Table 1

Z Test For Basic Life Support Components

COMPONENT	INTERACTIVE VIDEO (N=48)		TRADITIONAL (N=51)		Z
	%PASSED	%FAILED	%PASSED	%FAILED	
Single Rescuer (Heartsaver)	60.42	39.58	41.18	58.82	1.95
Two Rescuer	68.75	31.25	57.78	42.22	1.14
Obstructed Airway (Conscious)	87.23	12.77	71.11	28.89	2.04*
Obstructed Airway (Becomes Unconscious)	86.96	13.04	53.33	46.67	3.96*
Obstructed Airway (Found Unconscious)	81.25	18.75	51.11	48.89	3.35*
Infant	43.75	56.25	56.82	43.18	-1.32
Obstructed Airway (Infant Conscious)	70.21	29.79	79.55	20.45	1.54
Obstructed Airway (Infant Unconscious)	68.09	31.91	64.44	35.56	.39

* Significant at 1.96

Table 2
Theory Mean Scores

Interactive Videodisc Group (N=48)	84.35
Traditional Group (N=51)	82.76

No significant differance at $\alpha = .05$
(Sign test z = 1.75)

Table 3

LEARNER DIFFERENCES IN LEARNING SITUATION
SINGLY, AND IN GROUPS OF 2s, 3s, 4s

	Mean Time In Minutes	S D
GROUP 1 H.S/Cert		
Singly (n= 3)	254.33	115.77
In 2s, 3s, 4s (n=15)	226.73	52.65
GROUP 2 H.S/Recert		
Singly (n= 15)	190.73	70.54
In 2s, 3s, 4s, (n= 42)	201.19	91.90
GROUP 3 B.R. Recert		
Singly (n= 7)	329.14	131.91
In 2s, 3s, 4s, (n= 14)	330.71	98.54

Table 4

Subsample of Recertifiers in Heartsaver after Fast Track Instruction

	Mean Time to Learn and Test in Minutes	SD
Taught previously by interactive video system (n=3)	160.66	28.71
Taught previously by live instruction (n=7)	135.00	41.33

Table 5

RANKED CATEGORIES OF UNFAVORABLE RESPONSES (n= 96)

Unfavorable Categories of Responses	Number of Times Category Mentioned	Percent of n
Frustrating (at times)	36	38%
Detects faults too precisely	26	27%
Physically difficult	26	27%
Prefer live instructor (demonstrates/answers questions)	24	25%

Table 6
RANKED CATEGORIES OF FAVORABLE RESPONSES (n- 96)

Favorable Categories of Responses	Number of Times Category Mentioned	Percent of n
Fullness of evaluation feedback	86	90%
Precision of skill evaluation	66	69%
Self Paced (have control of time)	57	59%
Able to review and practice as needed	55	57%
Could participate in quizzes	35	36%
Can skip what you already know	23	24%